

## CLAIMS

1. An insulation degradation diagnostic device comprising:

5 a current detector configured to have a filtering function with an amount of attenuation of -60 dB or less and a slope characteristic of -5 dB/oct or less at a commercial frequency, and detect a current flowing through a line to be measured;

10 a first high-pass filter configured to remove a low frequency component from a current signal based on a current detected by the current detector;

a low-pass filter configured to remove a high frequency component from a current signal from the first high-pass  
15 filter;

an amplifier configured to amplify a current signal from the low-pass filter to a predetermined level;

a second high-pass filter configured to extract a signal corresponding to a discharge current caused by a  
20 partial discharge that has occurred in the line to be measured, from a current signal amplified by the amplifier; and

a discharge judgment section configured to judge whether or not a partial discharge has occurred in the line to be measured based on a signal extracted by the second  
25 high-pass filter.

2. The insulation degradation diagnostic device

according to claim 1, wherein the current detector detects a current flowing through an output winding wound around a core through which the line to be measured is inserted.

5 3. The insulation degradation diagnostic device according to claim 1, further comprising a canceling amplifier configured to amplify a current signal from the amplifier,

wherein an output winding and a tertiary winding are wound around a core through which the line to be measured  
10 is inserted and the current detector detects a current flowing through the output winding, and

the canceling amplifier amplifies a current signal from the amplifier and outputs it to the tertiary winding so as to cancel a predetermined frequency component from the output  
15 of the output winding.

4. The insulation degradation diagnostic device according to claim 1, wherein the second high-pass filter has frequency characteristics that a cutoff frequency is 100  
20 to 200 kHz and a slope characteristic is -18 dB/oct or less.

5. The insulation degradation diagnostic device according to claim 1, further comprising a delay circuit configured to invert and delay the output from the second  
25 high-pass filter,

wherein a signal that is a combination of the output of the delay circuit and the output of the second high-pass

filter is sent to the discharge judgment section.

6. The insulation degradation diagnostic device according to claim 1, wherein the discharge judgment section  
5 detects that a partial discharge has occurred in the line to be measured when the absolute value between the peak of the amplitude and the peak of an amplitude adjoining the amplitude of a signal from the second high-pass filter is within a predetermined range.

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7. The insulation degradation diagnostic device according to claim 1, wherein the discharge judgment section detects that a partial discharge has occurred in the line to be measured when the time between the first peak and the  
15 last peak of a signal from the second high-pass filter is equal to or less than a predetermined time.

8. The insulation degradation diagnostic device according to claim 1, wherein the current detectors are  
20 provided to at least three lines to be measured and the discharge judgment sections are provided respectively to the current detectors.

9. The insulation degradation diagnostic device  
25 according to claim 8, further comprising a current direction judgment section configured to receive a current signal from each discharge judgment section,

wherein the current direction judgment section judges, when the direction of one current signal out of at least three current signals is opposite to the direction of other current signals, that a partial discharge has occurred in the line to be measured corresponding to the one current signal.

10. The insulation degradation diagnostic device according to claim 1, further comprising:

a second current detector configured to have a filtering function with an amount of attenuation of -60 dB or less and a slope characteristic of -5 dB/oct or less at a commercial frequency, and detect a current flowing through another line connected to the line to be measured;

a third high-pass filter configured to remove a low frequency component from a current signal based on a current detected by the second current detector;

a second low-pass filter configured to remove a high frequency component from a current signal from the third high-pass filter;

a second amplifier configured to amplify a current signal from the second low-pass filter to a predetermined level;

a fourth high-pass filter configured to extract a signal corresponding to a discharge current caused by a partial discharge that has occurred in the another line, from a current signal amplified by the second amplifier;

a noise removal section configured to remove noises by

obtaining the difference between a first detection signal, which is a signal from the second high-pass filter to which envelope detection has been performed, and a second detection signal, which is a signal from the fourth high-pass filter to which envelope detection has been performed;

a second discharge judgment section configured to judge whether or not a partial discharge has occurred in the line to be measured based on a signal from which noises have been removed in the noise removal section; and

a final discharge judgment section configured to judge whether or not a partial discharge has occurred in the line to be measured based on the judgment result by the discharge judgment section and the judgment result by the second discharge judgment section.

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11. An insulation degradation diagnostic device comprising:

a first current detector configured to have a filtering function with an amount of attenuation of -60 dB or less and a slope characteristic of -5 dB/oct or less at a commercial frequency, and detect a current flowing through a line to be measured;

a first amplifier configured to amplify a signal based on a current detected by the first current detector to a predetermined level;

a low band pass filter configured to allow a frequency component belonging to a first frequency band to pass through,

from a signal amplified by the first amplifier;

a first high band pass filter configured to allow a frequency component belonging to a second frequency band to pass through, from a signal amplified by the first amplifier;

5 a low frequency discharge judgment section configured to judge whether or not a partial discharge has occurred in the line to be measured based on a first signal from the low band pass filter;

a second current detector configured to have a  
10 filtering function with an amount of attenuation of -60 dB or less and a slope characteristic of -5 dB/oct or less at a commercial frequency, and detect a current flowing through another line connected to the line to be measured;

a second amplifier configured to amplify a signal based  
15 on a current detected by the second current detector to a predetermined level;

a second high band pass filter configured to allow a frequency component belonging to a second frequency band to pass through, from a signal amplified by the second amplifier;

20 a polarity judgment section configured to judge whether or not the opposite polarity is possessed by comparing the polarity of a second signal from the first high band pass filter with the polarity of a third signal from the second high band pass filter;

25 a canceling circuit configured to remove noises from the second signal by applying an arithmetic operation to the second signal and the third signal;

a high frequency discharge judgment section configured to judge whether or not a partial discharge has occurred in the line to be measured based on a fourth signal from the canceling circuit;

5        a ratio comparison section configured to judge whether or not a partial discharge has occurred in the line to be measured based on a ratio between the first signal and the fourth signal; and

10       a final discharge judgment section configured to finally judge whether or not a partial discharge has occurred in the line to be measured based on the judgment result by the low frequency discharge judgment section, the judgment result by the high frequency discharge judgment section, and the judgment result by the ratio comparison section.

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12.    The insulation degradation diagnostic device according to claim 10, wherein the first frequency band is 100 to 500 KHz and the second frequency band is 1.5 to 5 MHz.

20    13.   The insulation degradation diagnostic device according to claim 10, wherein the first frequency band is 1.5 to 4 MHz and the second frequency band is 5 to 8 MHz.